

NPNRD 2023 Robust Review

March 14, 2024



Presentation Overview

- Integrated Water Management Overview
- Robust Review Analysis
 - Introduction
 - Updates to Model
 - SPNRD Model Inputs
 - SPNRD Results
- Path Forward



Integrated Water Management Overview

IWM – Overview

Statutes

- *Nebraska Revised Statute* § 46-713(3): A river basin, subbasin, or reach shall be deemed fully appropriated if
 - Current uses of hydrologically connected surface water and ground water... will cause insufficient streamflow / surface water supply for:
 - (a) existing surface water appropriations,
 - (b) dependent wells, or
 - (c) noncompliance with an interstate compact, decree, agreement, or applicable state or federal laws



IWM – Overview

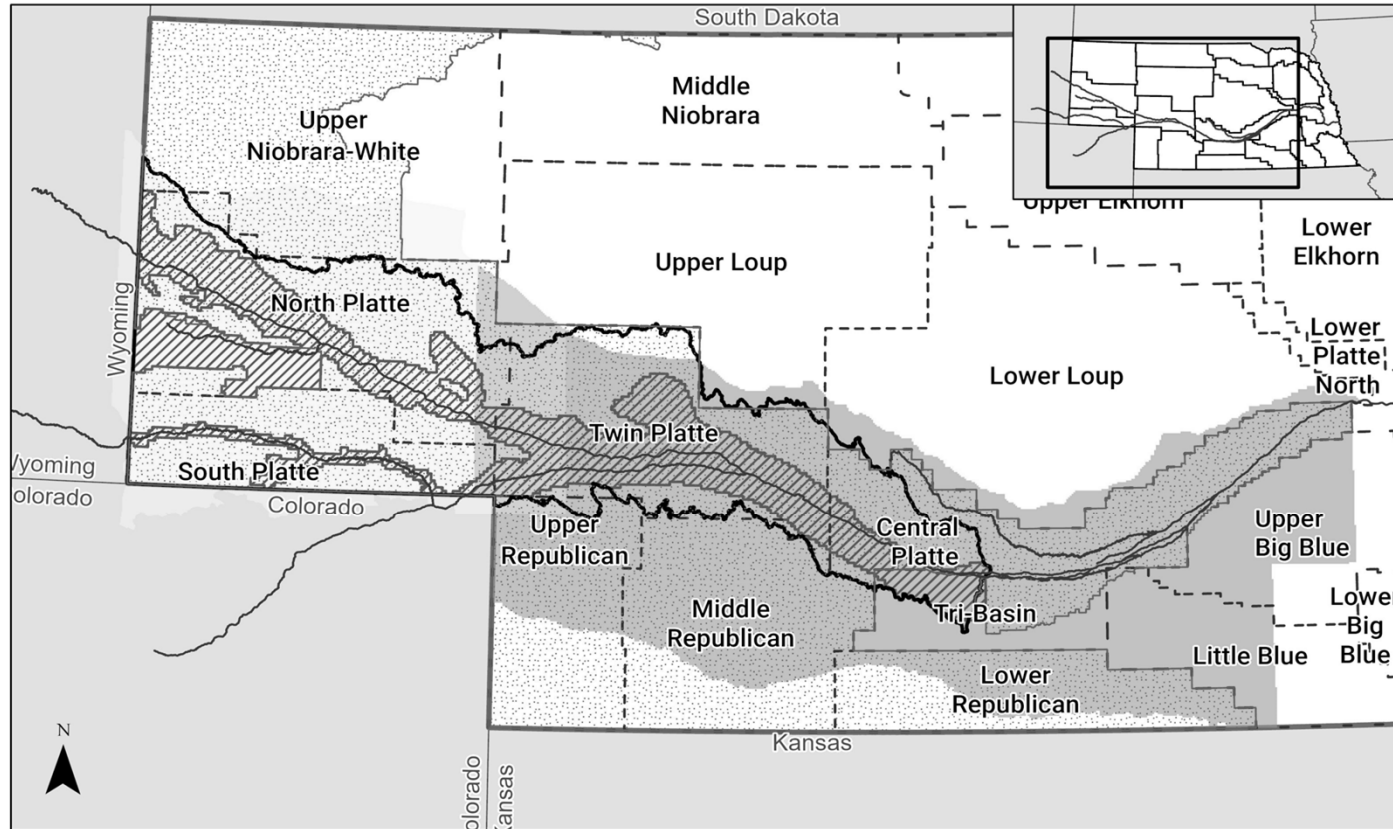
Statutes

- *Nebraska Revised Statute § 46-713(4)(a)*: A river basin, subbasin, or reach shall be deemed overappropriated if on July 16, 2004:
 - subject to an interstate cooperative agreement
 - and, the NeDNR has declared a moratorium on new surface water appropriations
 - and has requested each NRD
 - To close the issuance of additional water well permits
 - Or to temporarily suspend the drilling of new water wells



IWM - Overview

Fully and Overappropriated Areas within Model Area



Upper Platte River Model Areas

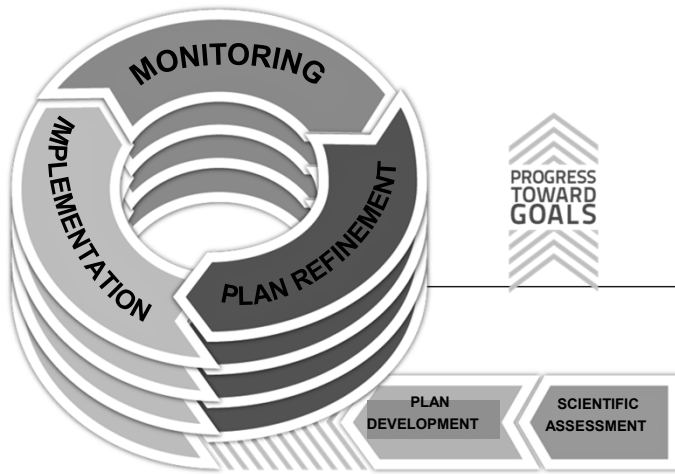
0 25 50 100 Miles

- River
- - - NRD
- Fully Appropriated Area
- ▭ Overappropriated Surface Water Area
- COHYST Model Area
- WWUM Model Area
- Model Area Overlap
- ▨ Hydrologically Connected Groundwater Area

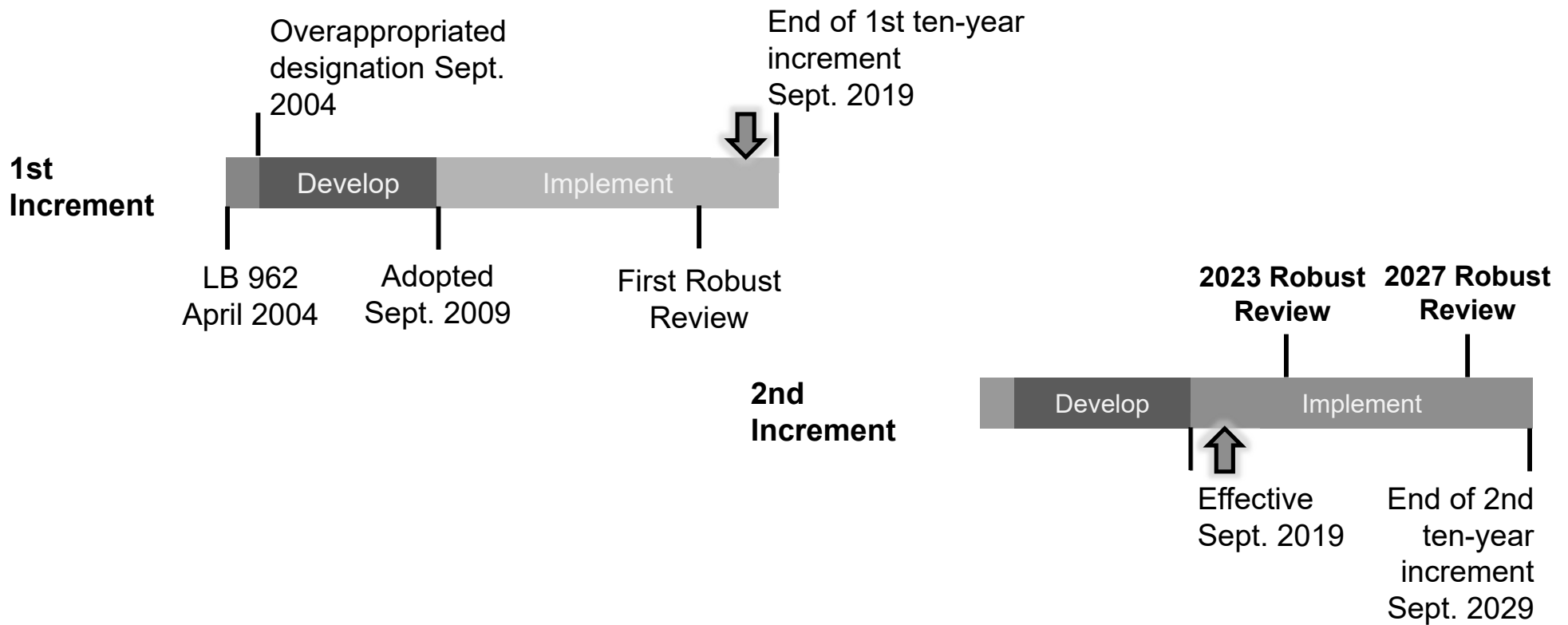
IWM – Overview

Statutes

- *Nebraska Revised Statute § 46-715(5)*:
 - ✓ IMPs
 - ✓ Basin-wide Plan
 - ✓ Use Consultation & Collaboration Process
 - ✓ Identify overall difference between Over and Fully appropriated
 - ✓ Incremental (10 year) Approach to Fully Appropriated Impacts (stream depletion) of water use initiated after 7/1/1997 to existing users
 - ✓ Technical Analysis to evaluate progress (Robust Review)
 - ✓ Repeat Increments until Fully Appropriated
 - ✓ Afterwards, maintain Fully Appropriated condition

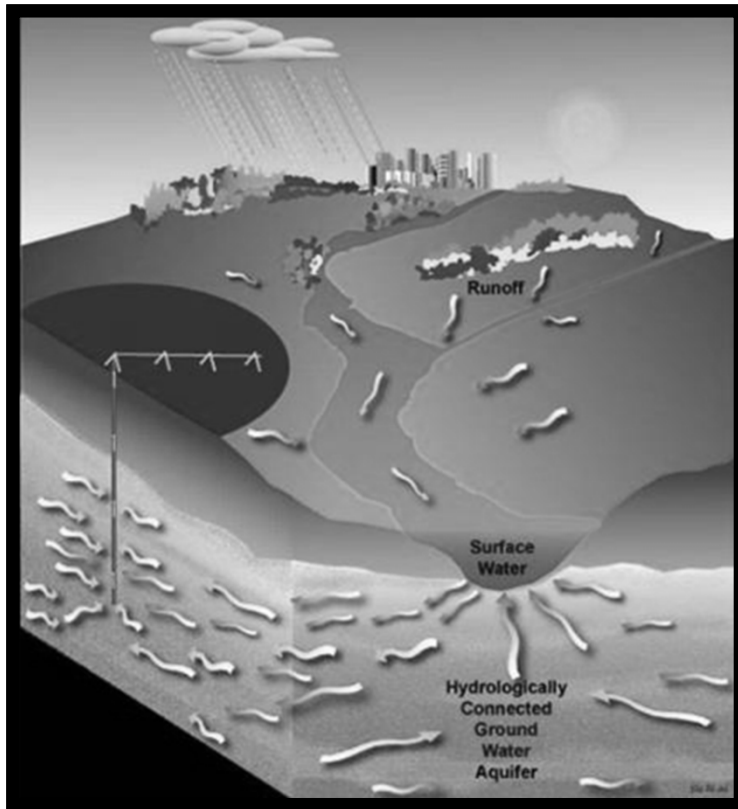


IWM – Overview Timeline & Process



IWM – Overview

Surface & Ground Water Authorities



Surface Water

- Regulated by NeDNR
- Prior appropriations
- First in time is first in right

↑
Integrated
water
management
↓

Groundwater

- Regulated by NRDs
- Correlative rights
- Share and share alike

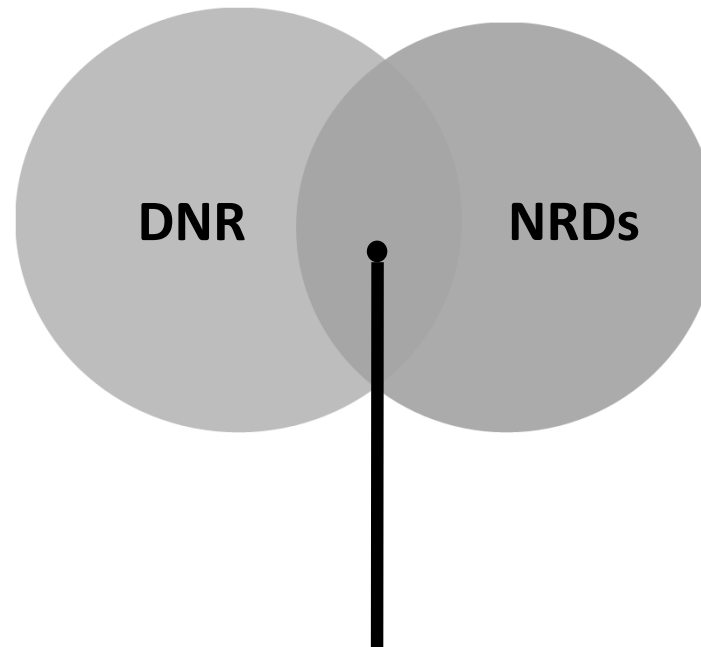
- 46-715(1)(a): ...jointly develop an IMP....
- 46-719: IWRB, resolving disputes between NRDs and NeDNR

IWM – Overview

Roles and Responsibilities

DNR'S INDIVIDUAL ROLES:

- Implement and enforce surface water controls
- Provide Reports on new water use and permitting activities to the NRD
- Implement surface water monitoring and data collection activities



NRD'S INDIVIDUAL ROLES:

- Implement and enforce groundwater controls
- Provide reports on new water use and permitting activities to DNR
- Implement groundwater monitoring or data collection activities

JOINT DNR/NRD ROLES:

- Coordinate on joint implementation aspects of the plan
- Review annual reports and data that is collected
- Conduct Robust Review and other IMP required analyses
- Keep stakeholders informed on progress towards fulfilling plan goals

IWM – Overview

Goals and Objectives

- Clear Goals & Objectives of BWP's & IMP's § 46-715(2)(a)
 - Protect existing uses from negative impacts of new uses

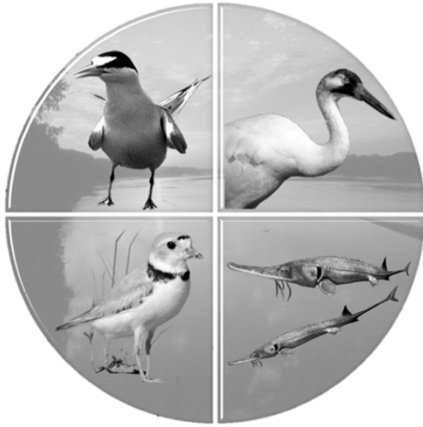
 - Ensure both the short-term and long-term balance of water supplies and uses to maintain
 - Economic viability
 - Social and environmental health
 - Safety
 - Overall welfare of the basin

- Meet interstate agreement compliance obligation



IWM – Overview

Interstate Compliance



Platte River Recovery Implementation Program (PRRIP) & Nebraska New Depletion Plan (NNDP)

- The Extended First Increment ends December 2032
- Associated Habitat Reach: Platte River from Lexington to Chapman, NE
- PRRIP Water Action Plan projects can be used to meet post-1997 offset requirements towards fully appropriated
- Prevent streamflow depletions that would cause non-compliance
- Requires annual reporting of new or expanded uses
- ✓ The Basin-wide Plan and IMPs have goals, objectives and action items to ensure compliance with the Program

IWM – Overview

Relationship between Basin and NRD Plans

BWP

All basin NRDs and NeDNR

Overappropriated Area

Goals & objectives:

- Focus on regional, cross-boundary issues and opportunities
- Consistency and collaboration among basin NRDs
- A broad framework used for basing IMPs

IMP

1 NRD and NeDNR

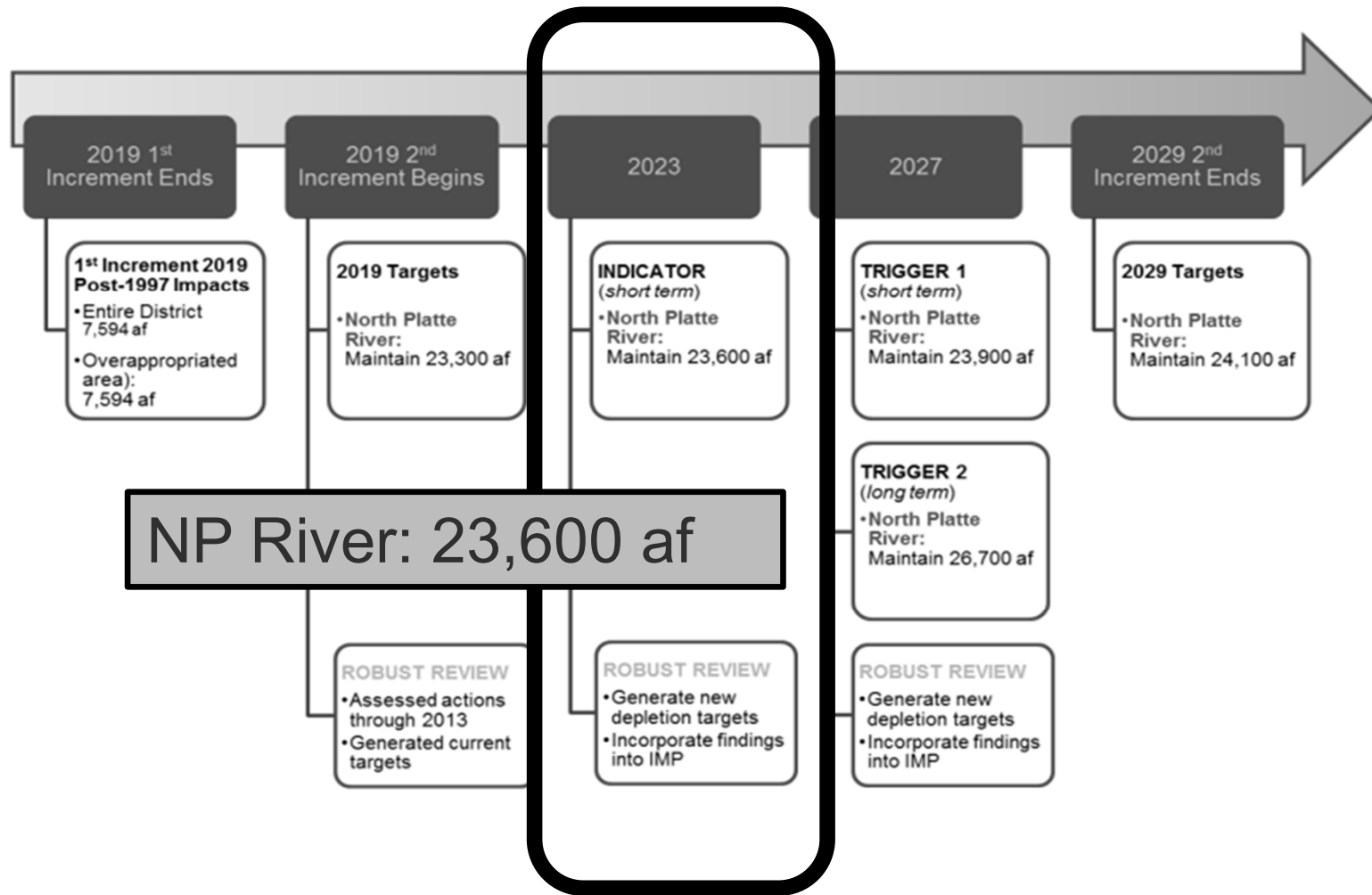
Overappropriated and Fully Appropriated Areas

Goals, objectives, & controls:

- Specific to the one NRD
- Tailored to local issues
- Specific targets and actions

IWM – Overview

NPNRD IMP Requirements -Triggers



2023 Robust Review Analysis: Introduction

Robust Review

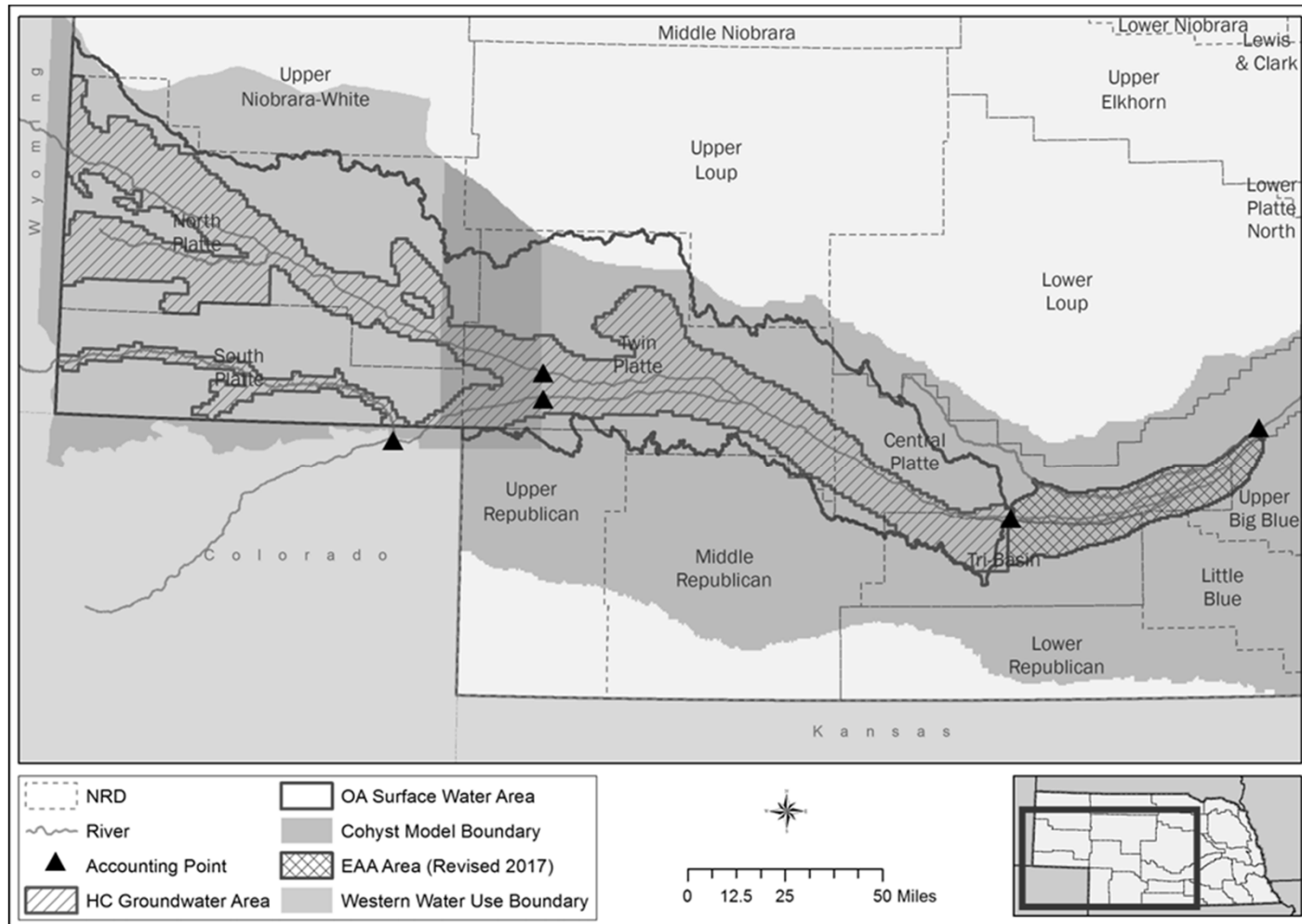
Introduction

Goals of Robust Review

- Assess progress on second increment goals and objectives (2023 Indicators)
- Assess compliance with PRRIP and NNDP
- Provide information for decision makers

Robust Review Introduction

Analysis Set-Up: Map (Model Area)



Robust Review

Introduction

Simulation Set-Up

- Model simulation period: 1953-2020, extended to 2070
- NPNRD Scenario repeat:
 - 2015-2019
 - Includes full allocation cycle
 - Captures a wetter than average climate period
- Results are summarized for:
 - North Platte River

2023 Robust Review Analysis: Updates to Model

Robust Review Analysis

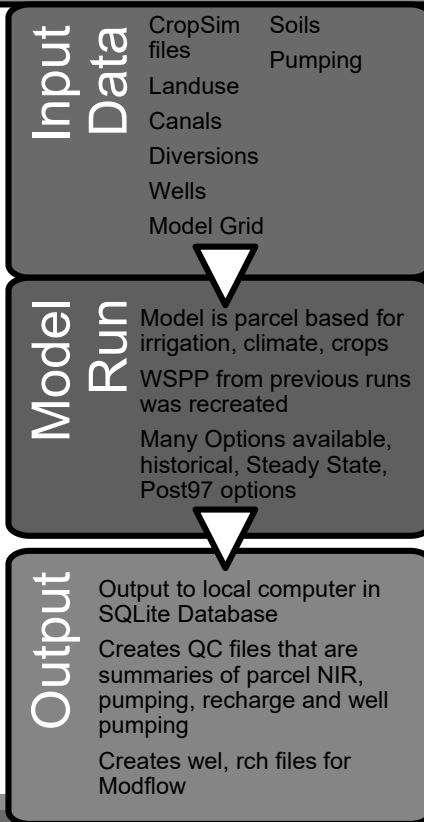
Updates to Model

Western Water Use Management Modeling (WWUMM) Overview

CropSim

ESC Model

GW Model



Robust Review Analysis

Updates to Model

Major Differences from 2019 Robust Review

- Update input data 2014 through 2020
 - Climate data
 - Land use
 - Crops
 - Meter data

- Update Cropsim/Watershed Model to ESC
 - Parcel based calculations
 - Modified crop growth specifications

- Update Groundwater Model to Modflow 6
 - New solver & pumping function / fixed dry cells
 - Brule Fractures
 - Base of Aquifer

Robust Review Analysis

Updates to Model

Impacts to Overall Water Budget (WWUMM)

- ESC Appears to have a net effect of reduced recharge
 - Replaced a weather station
 - Impacted by change from grass pasture to native vegetation
- More modeled groundwater pumping is occurring
 - Impacted by aquifer adjustments (base/fractures)
 - Dry cells resolved

Robust Review Analysis

Performance of Updates to Model

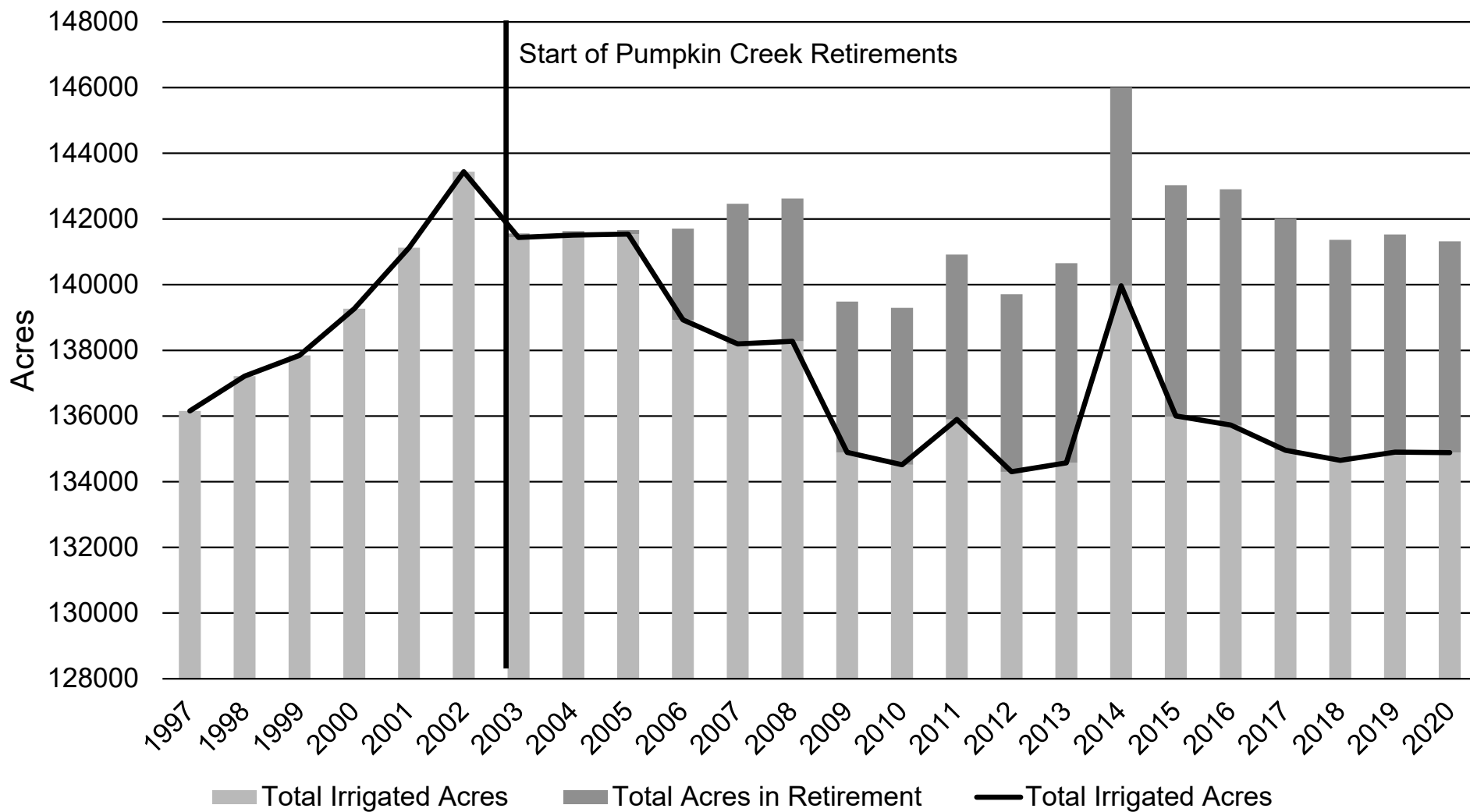
- Significant changes to aquifer properties & model update

- Model performs comparatively well to the prior model
 - Underestimates groundwater levels in the vicinity of the South Platte River
 - Overestimated heads and underestimated baseflows in the last 10-15 years of the calibration period along the North Platte River in the western half of the model domain

- Recalibration is suggested before next robust review

2023 Robust Review: Management Actions & Other Inputs

Management Action & Model Input: Net Change in Groundwater-Only Irrigated Acres 1997 to 2020



Slide 25

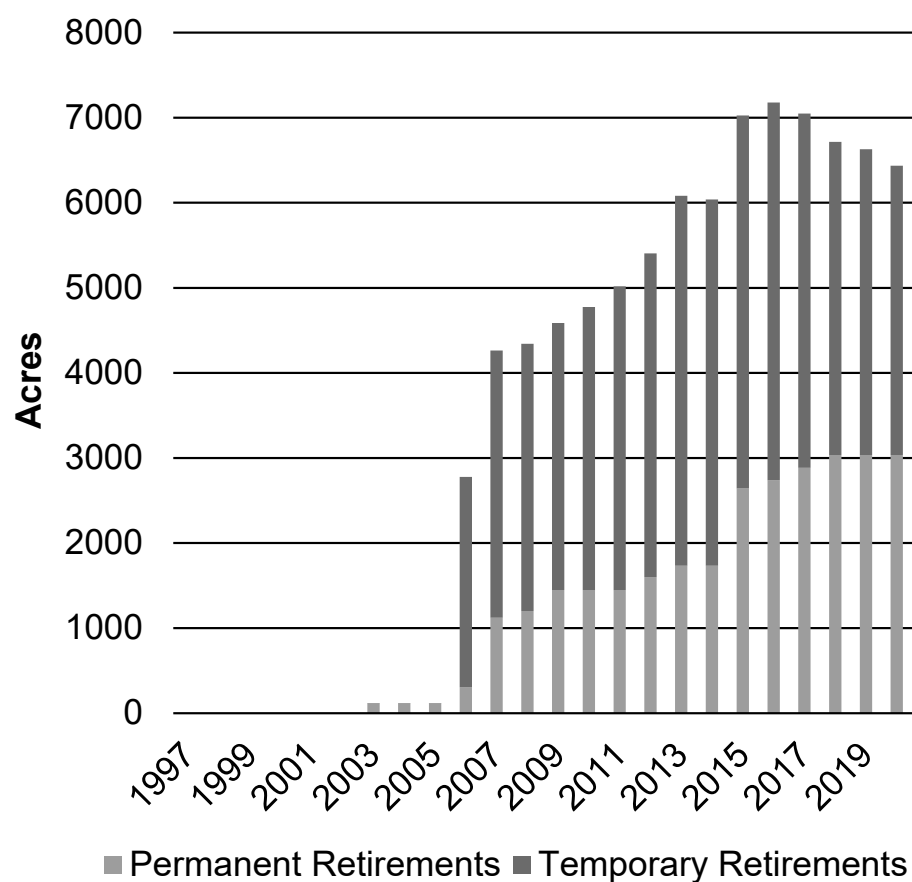
CMO

Alternate slide - is this what you were thinking Thad?

Carter, Margeaux, 2024-03-11T18:13:28.727

Management Action & Model Input: Decertified groundwater only irrigated acres

GW Retirements 1995-2020

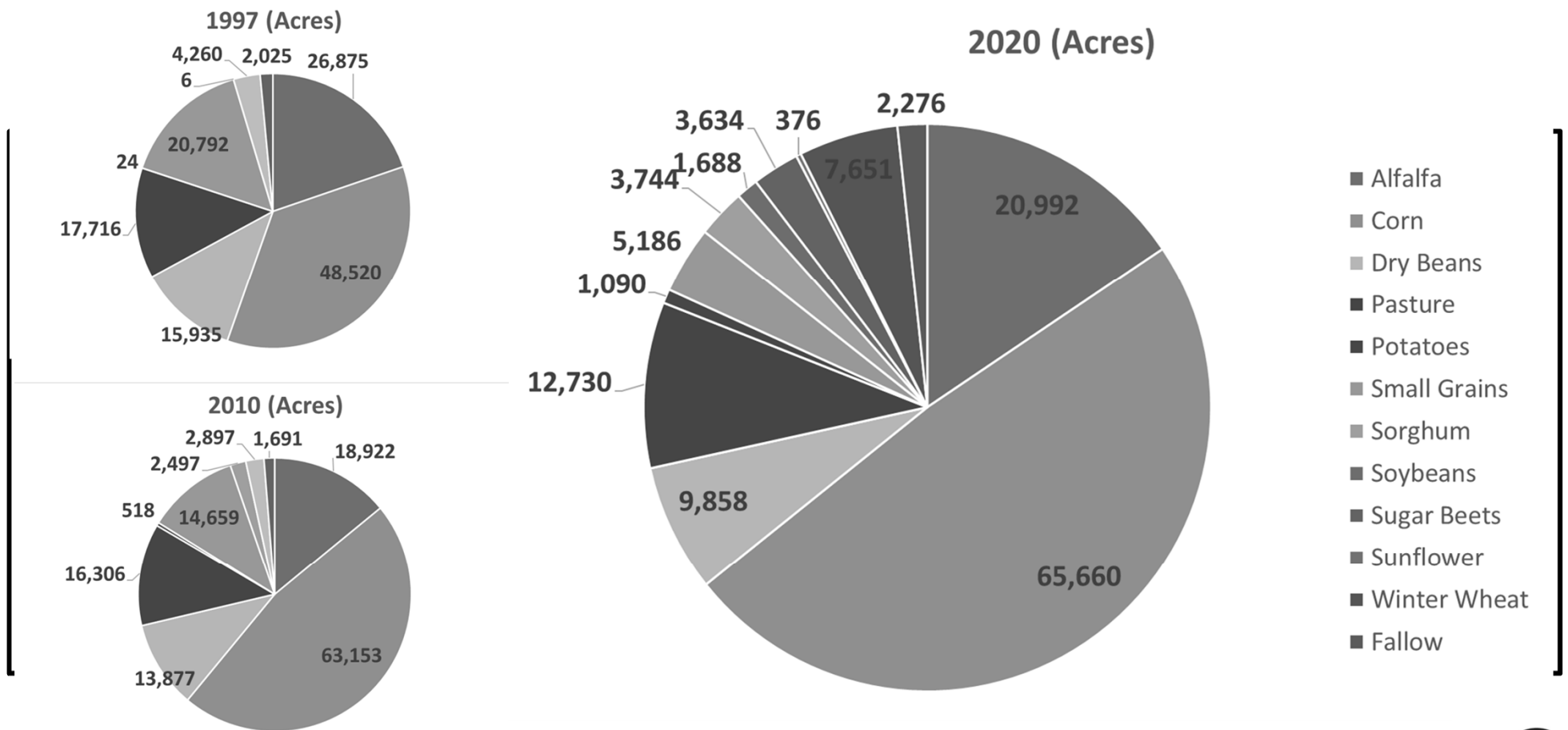


- Retirements began in 2003
- Modeled as net pumping
 - Allocation*efficiency*acres
- Average NRD-wide change in CU
 - ~10 Inches/Acre/Year



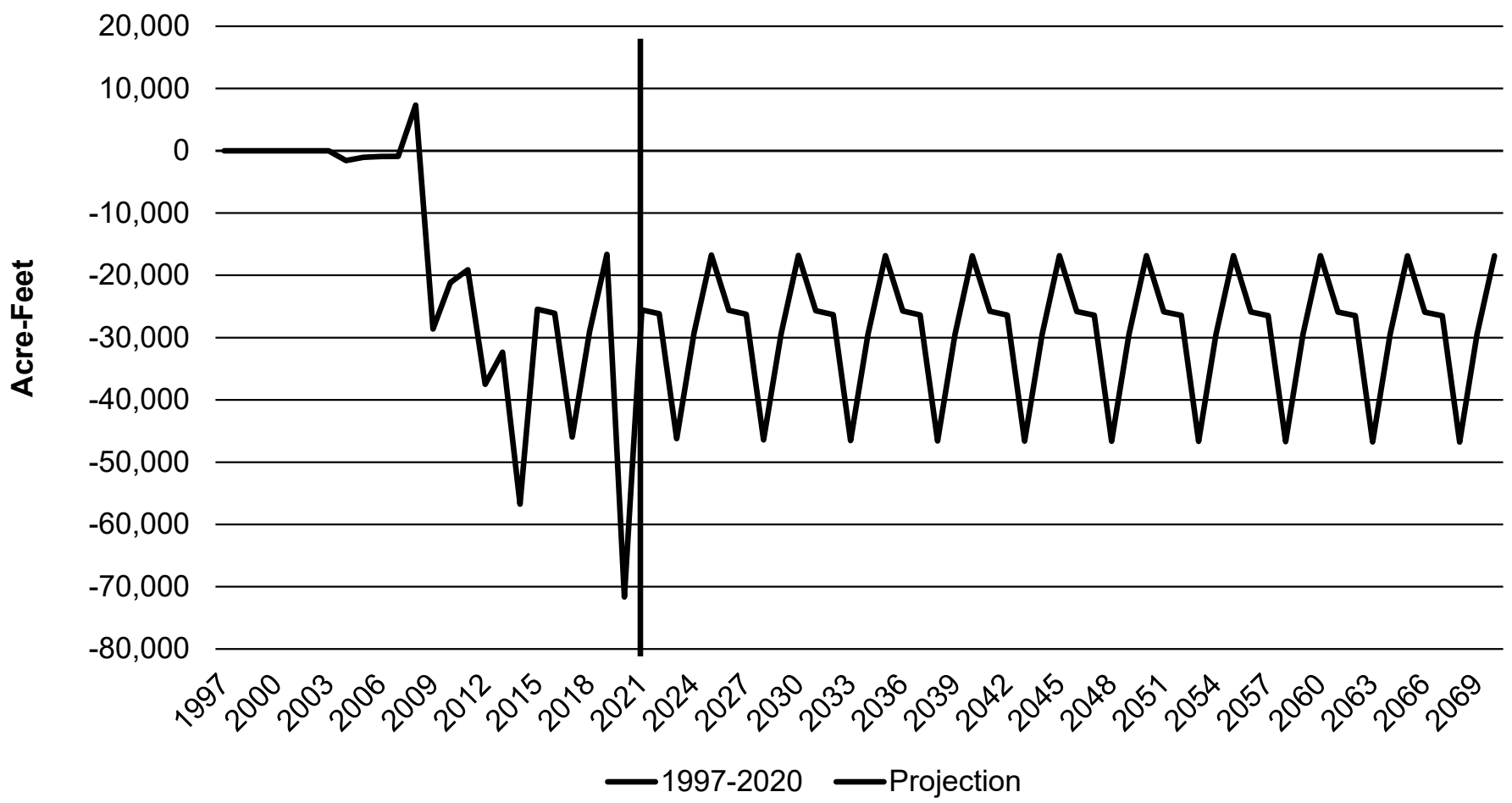
Management Action & Model Input:

Change in Groundwater-Only Irrigated Crop Types



Management Action & Model Input: Allocations

Change in Groundwater-Only Irrigation Pumping: Allocations



Slide 28

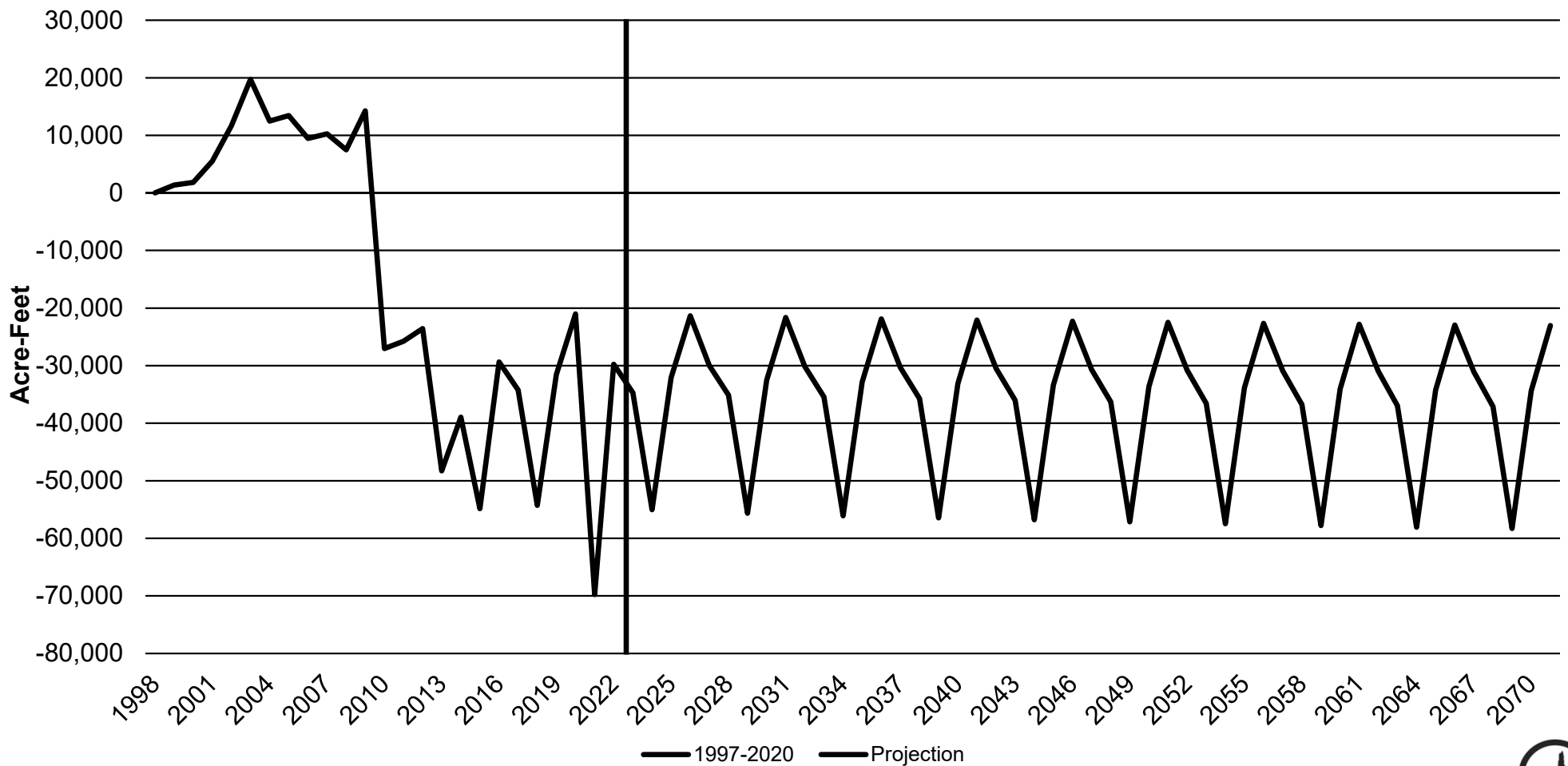
CMO

Add in vertical line to more clearly visually separate the historic/projection period

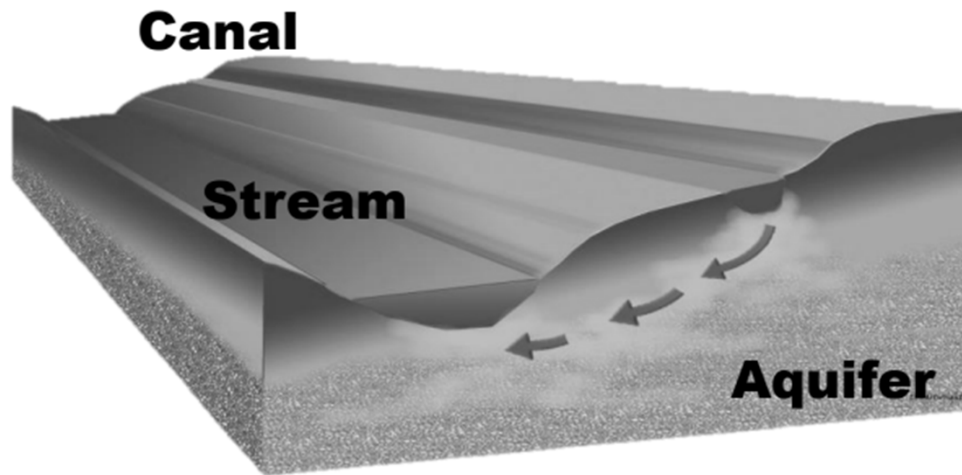
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Management Action & Model Input:

Change in Groundwater-Only Irrigation Pumping: Total

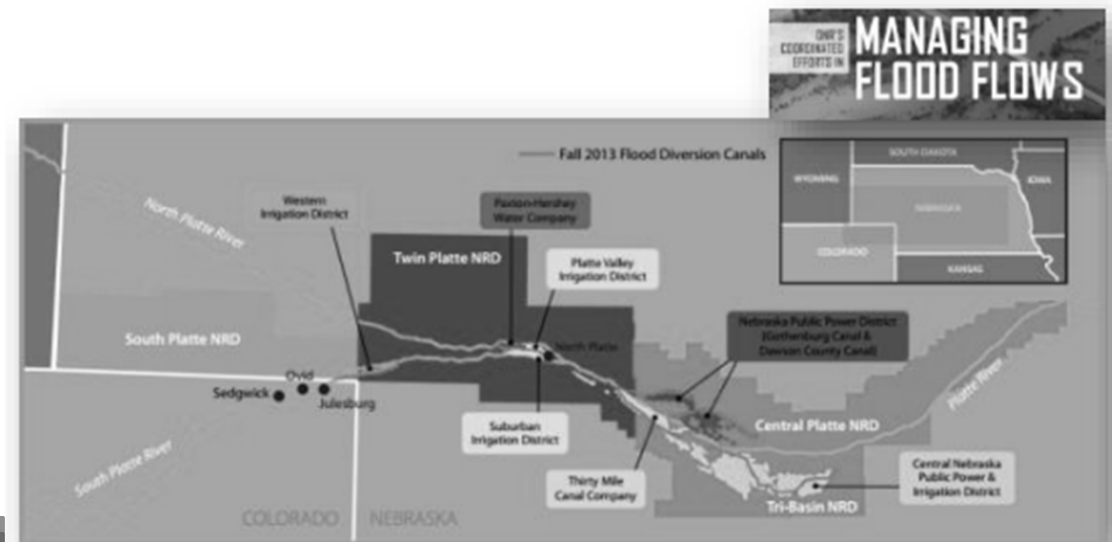


Management Action: Conjunctive Water Management (CWM)



Conjunctive Water Management is an *adaptive process* that utilizes the *connection* between surface water and groundwater to *maximize water use*, while *minimizing impacts* to streamflow and groundwater levels in an effort to increase the overall water supply of a region and improve the reliability of that supply.

- Excess flow capture
- Augmentation
- Water leasing
- Water transfers
- Canal refurbishment

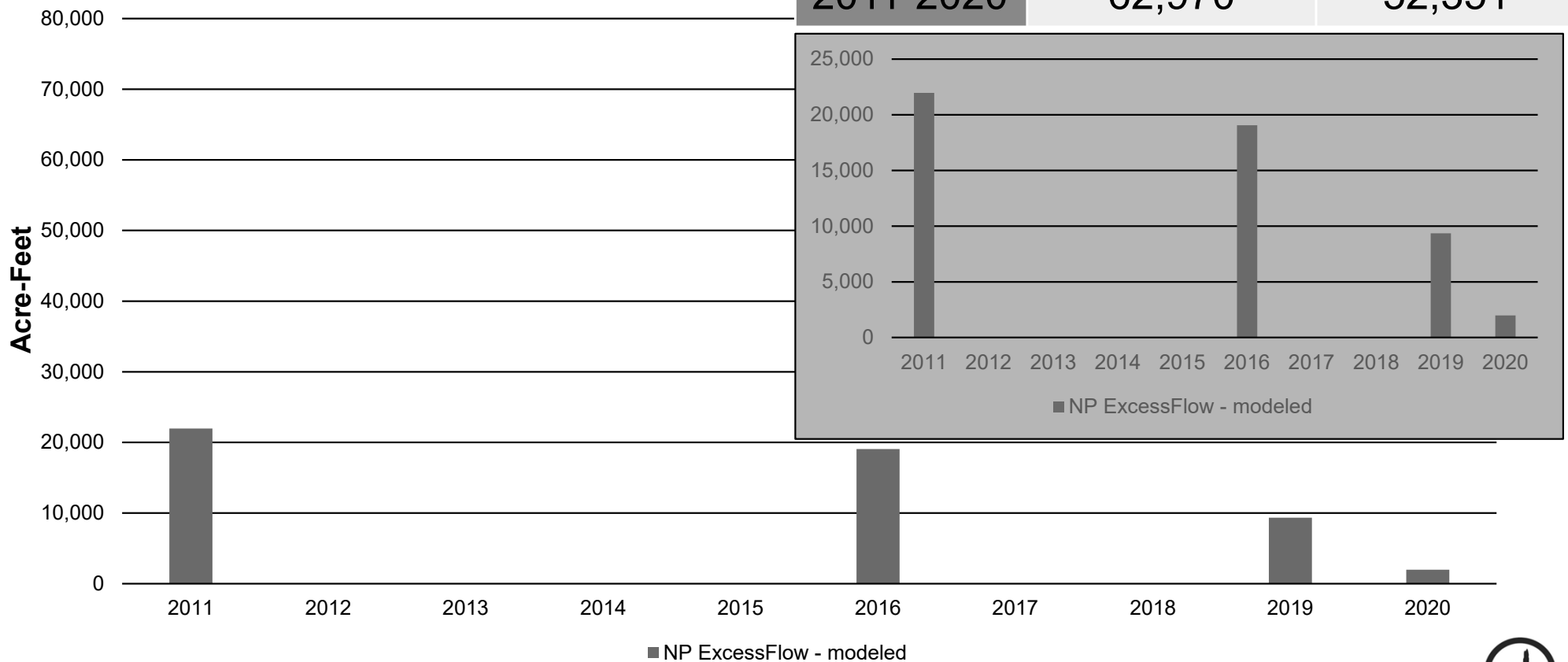


Management Action: CWM / Excess

Flows

Excess Flow Recharge

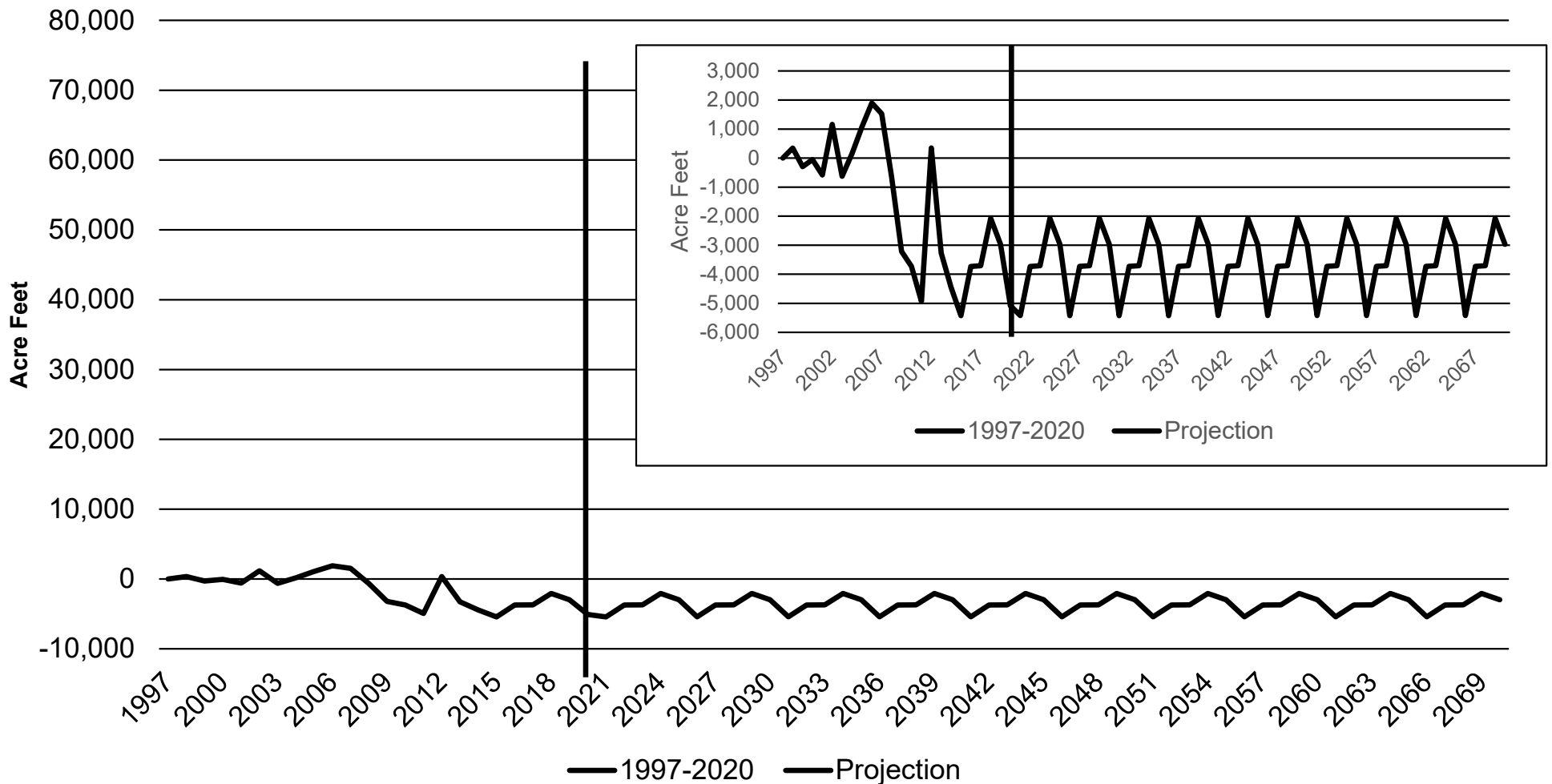
NPNRD	Acre-Feet of Excess Flow	
	Diversion	Recharge
2011-2020	62,970	52,351



Recharge values for 2011, 2016 do not match historic records due to modeling limitations

Management Action & Model Input:

Change in Municipal and Industrial Pumping from 1997



2023 Robust Review: Analysis – NPNRD Results

Robust Review Analyses

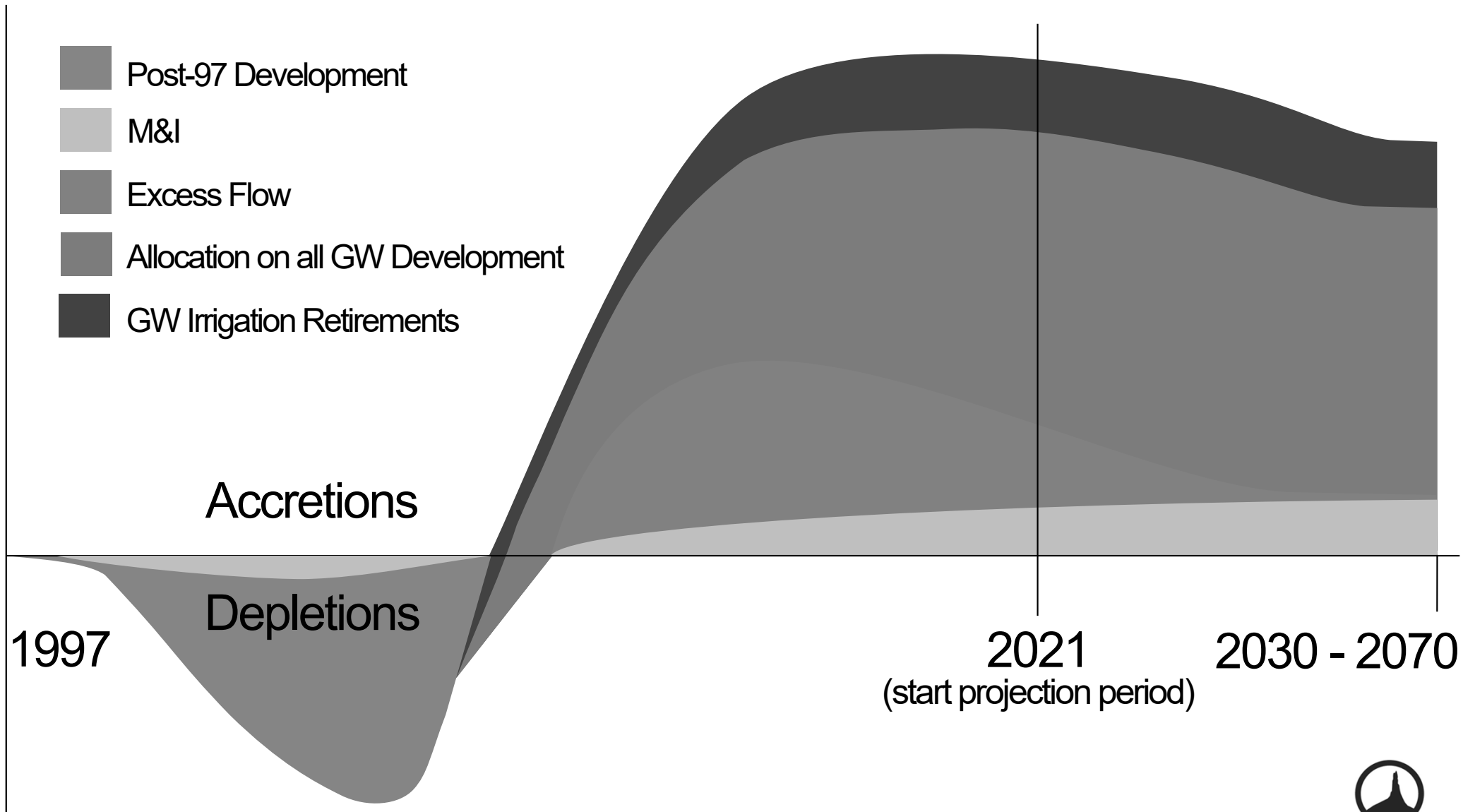
- Post-1997 Analysis
 - Historic Run (Same as last RR)
 - 1997 Development Run (Same as last RR)
 - Excess Flow Analysis (Same as last RR)
 - Allocation Effect Analysis (New to RR)
 - Ground Water Irrigation Retirements Analysis (New)
 - M&I Analysis (Same as last RR)

- Total Depletions Analysis (Same as last RR)

- Livestock Analysis (Same as last RR)

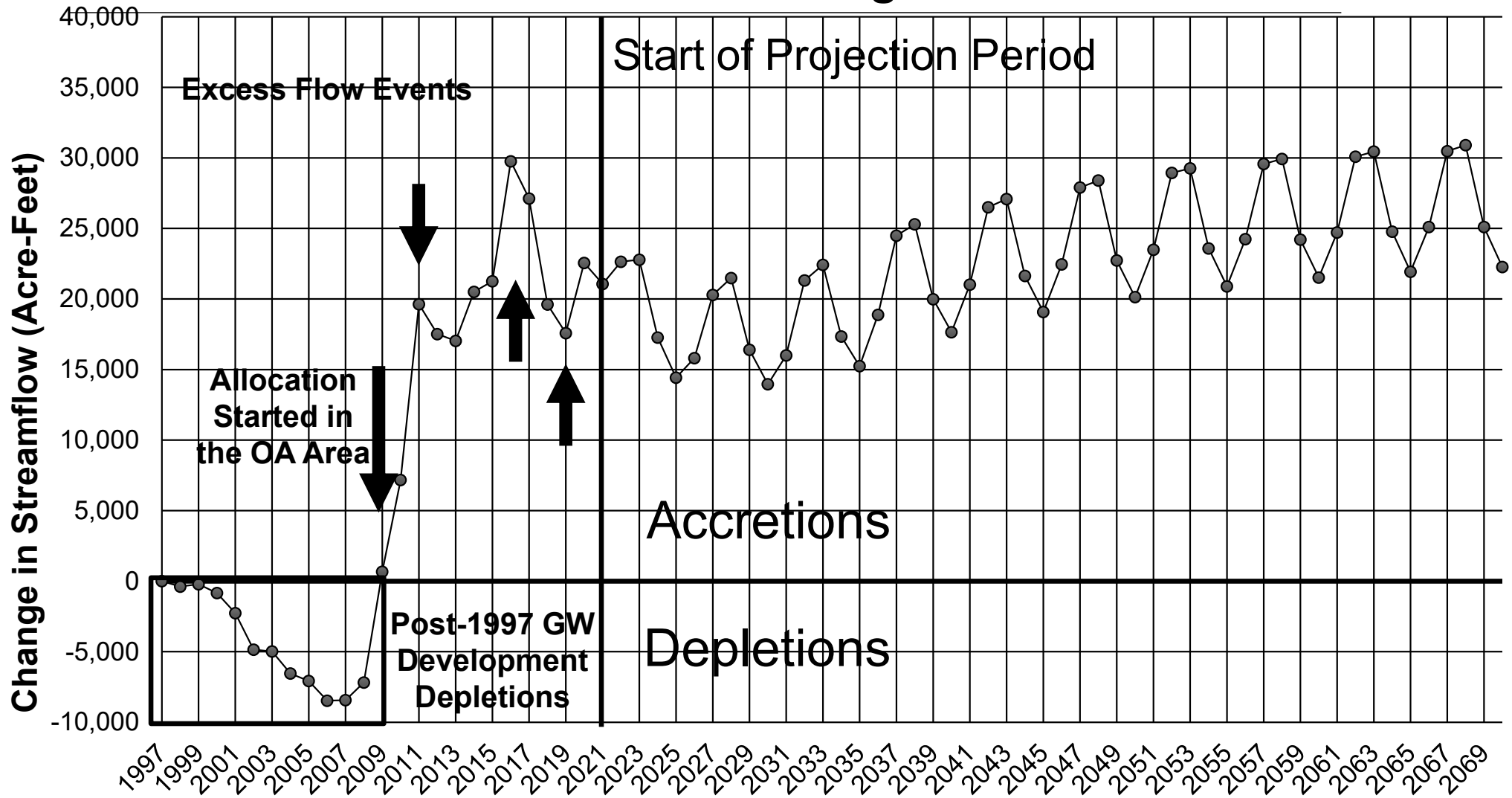
- Surface Water Retirements Analysis (New) – In progress

Model-Wide Streamflow Impacts for Post-1997 Management Actions



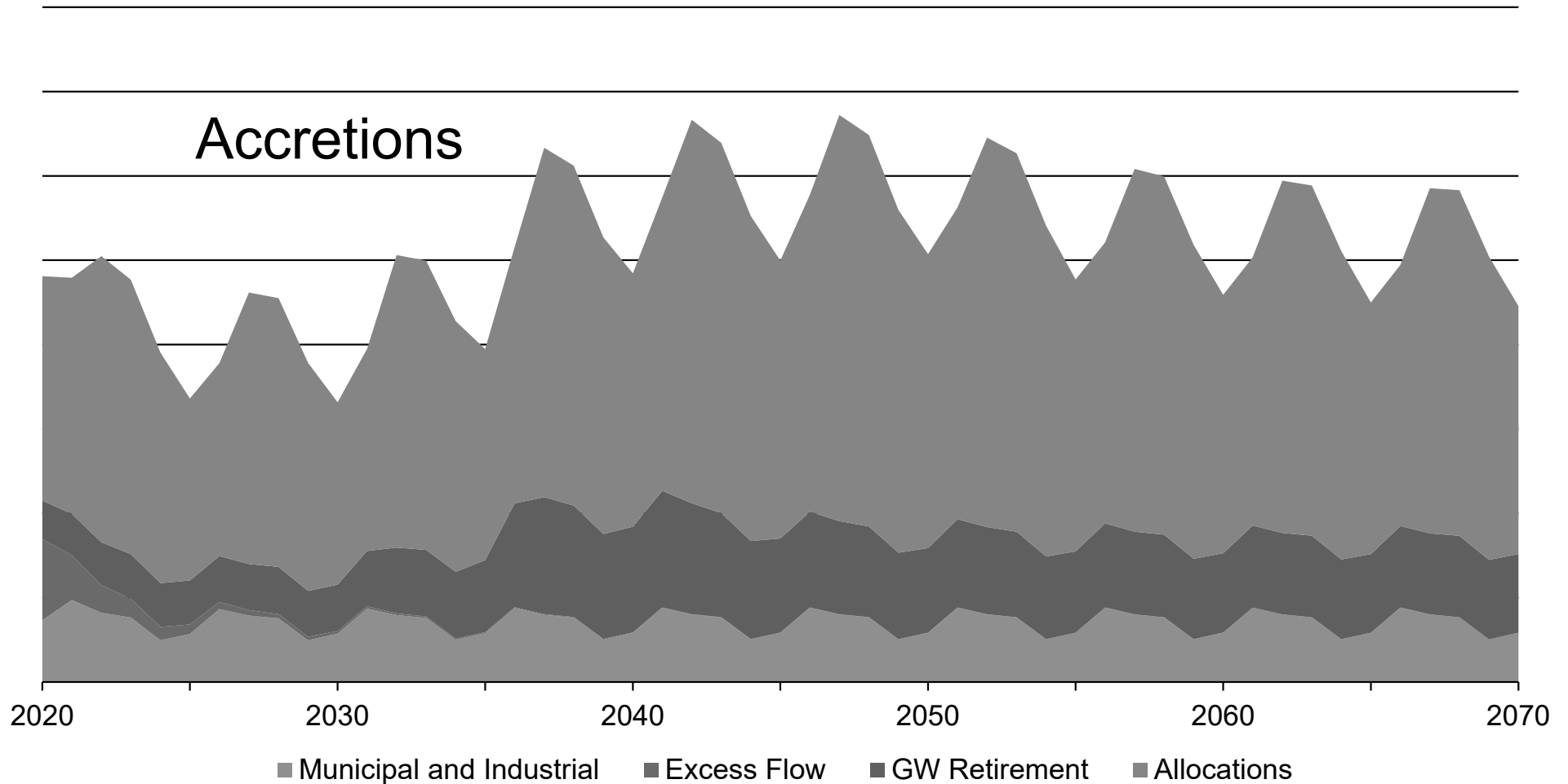
North Platte River

Combined Post-1997 Impacts- Robust Review Analysis Results North Platte NRD: Change in Streamflow

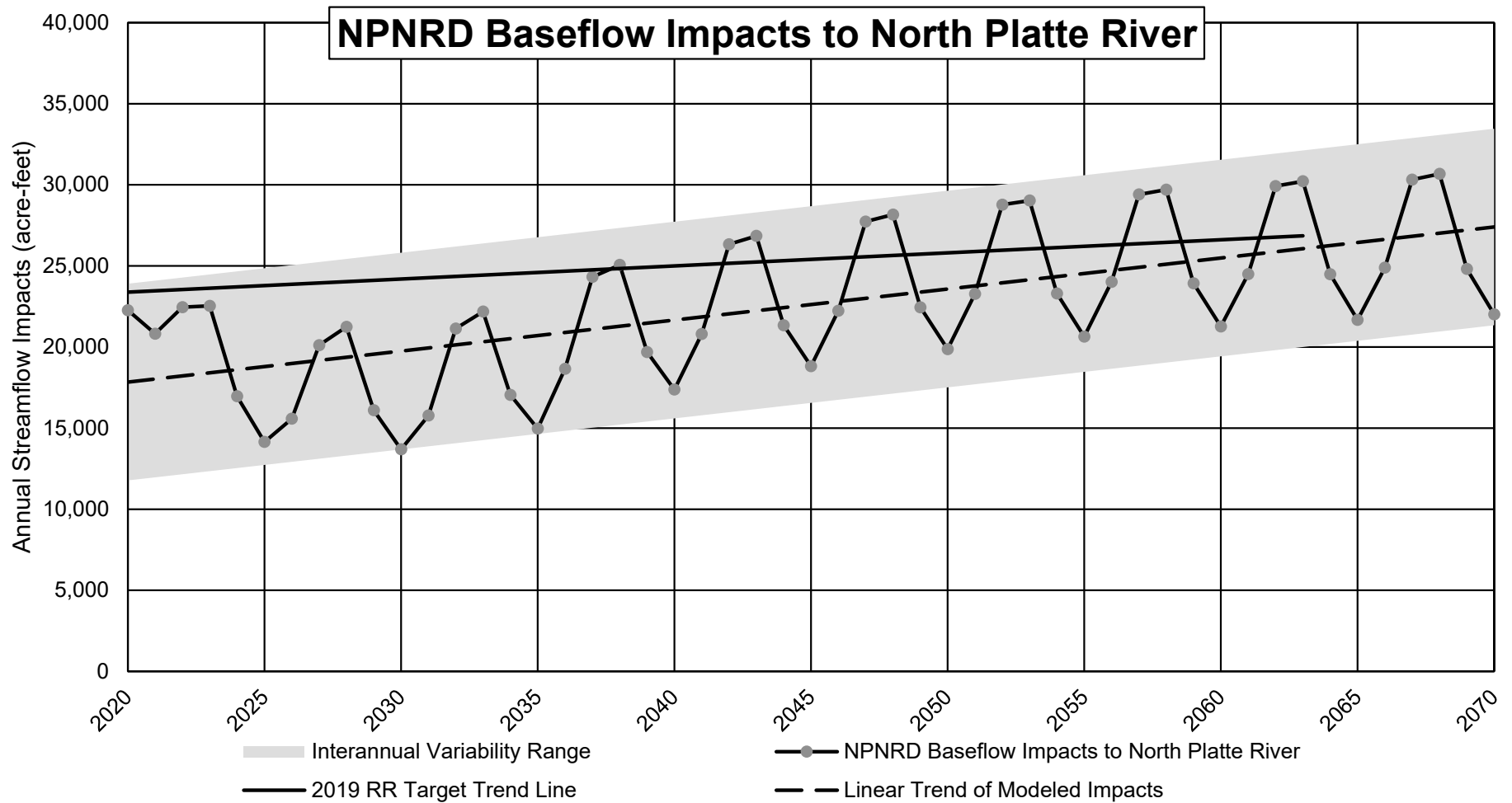


NPNRD Results

Future Projection Generalized Components



Updated Targets North Platte River



Indicator* Review: North Platte River

Arial	Current IMP Targets	2023 Robust Review Targets
2019	23,300	17,600
2020	23,400	17,800
2021	23,500	18,000
2022	23,500	18,200
<u>2023*</u>	<u>23,600</u>	<u>18,400</u>
2024	23,700	18,600
2025	23,700	18,800
2026	23,900	19,000
2027	23,900	19,200
2028	24,000	19,400
2029	24,100	19,600

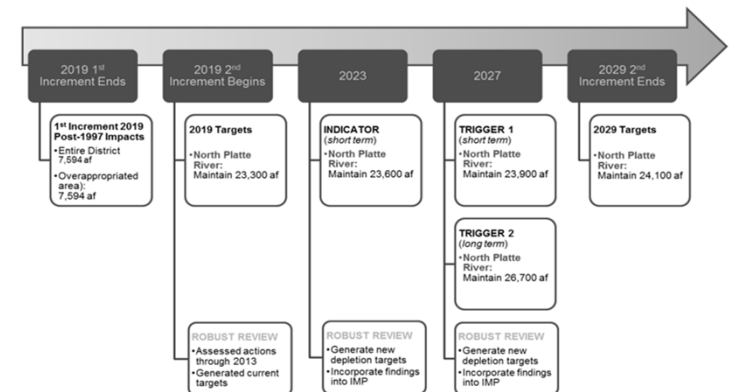


IMP Target Summary

No Changes to the IMP are Necessary

“additional regulatory actions will not be required as long as either:

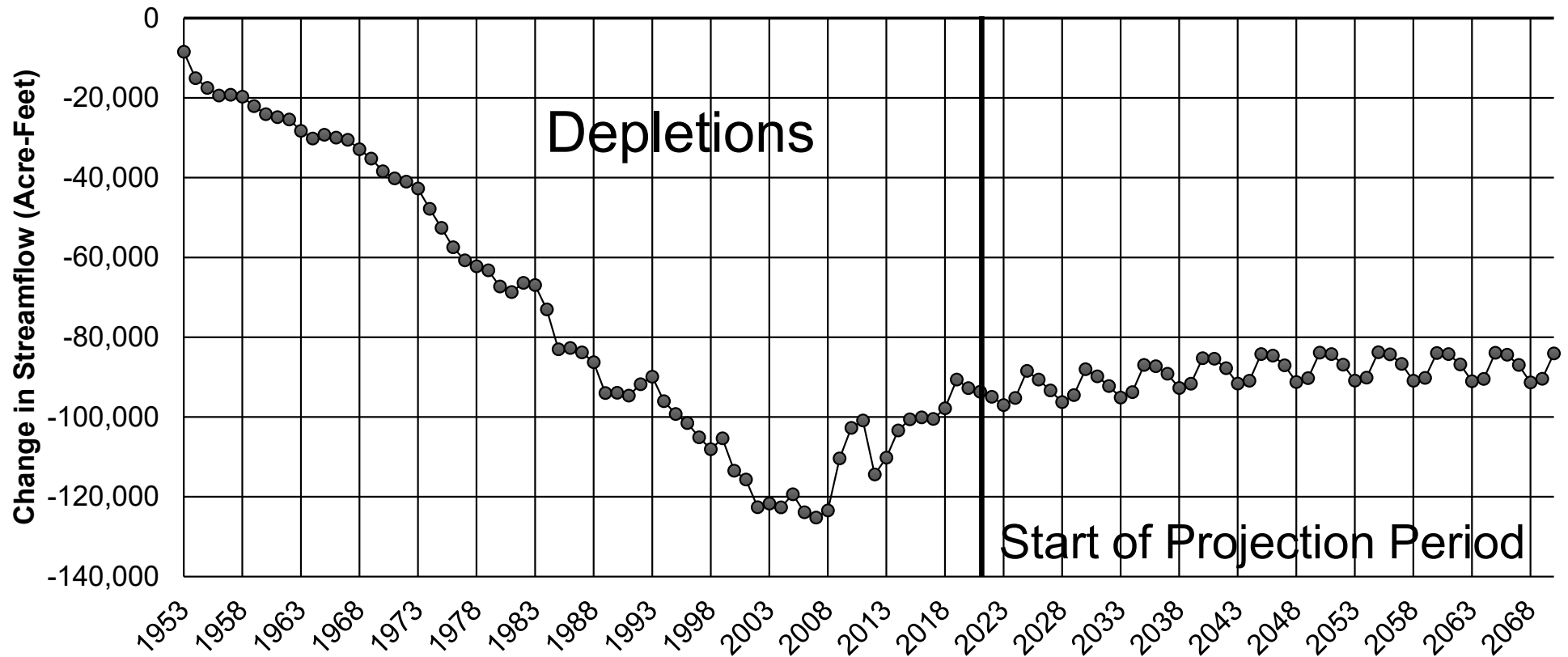
- 1) The 2023 Robust Review shows that management actions offset post-1997 depletions
- 2) The NPNRD maintains their management actions.”



NPNRD Results – Total Depletions

Impacts from all Groundwater Pumping

NPNRD: North Platte River



Slide 42

CM0

I'm not sure where we want this

Carter, Margeaux, 2024-03-11T18:38:09.526

CM0 0

And I kind of think the labels are overwhelming.

Carter, Margeaux, 2024-03-11T18:38:30.235

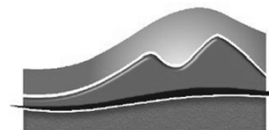
Path Forward

Path Forward / Next Steps

- Finish Documentation of Models and Analyses
- Present Results during May PRRIP meeting
- Present Results during August 1st BWP Stakeholder meeting
- Prepare for 2027 Robust Review in this Increment
 - Model Updates
 - Recalibration
 - Data
- Develop Basin-Wide and NRD drought plans
 - UPRDCP to be in place by end of 2024
- Changes to Municipal and Industrial offset requirements in 2026



North **Platte**
NATURAL RESOURCES DISTRICT



ADAPTIVE RESOURCES
INC
WATER • GEOLOGY • MAPPING

THANK YOU

Jennifer Schellpeper, Water Planning, NeDNR

NPNRD Results – Management Actions

Impacts from Surface Water Decertification

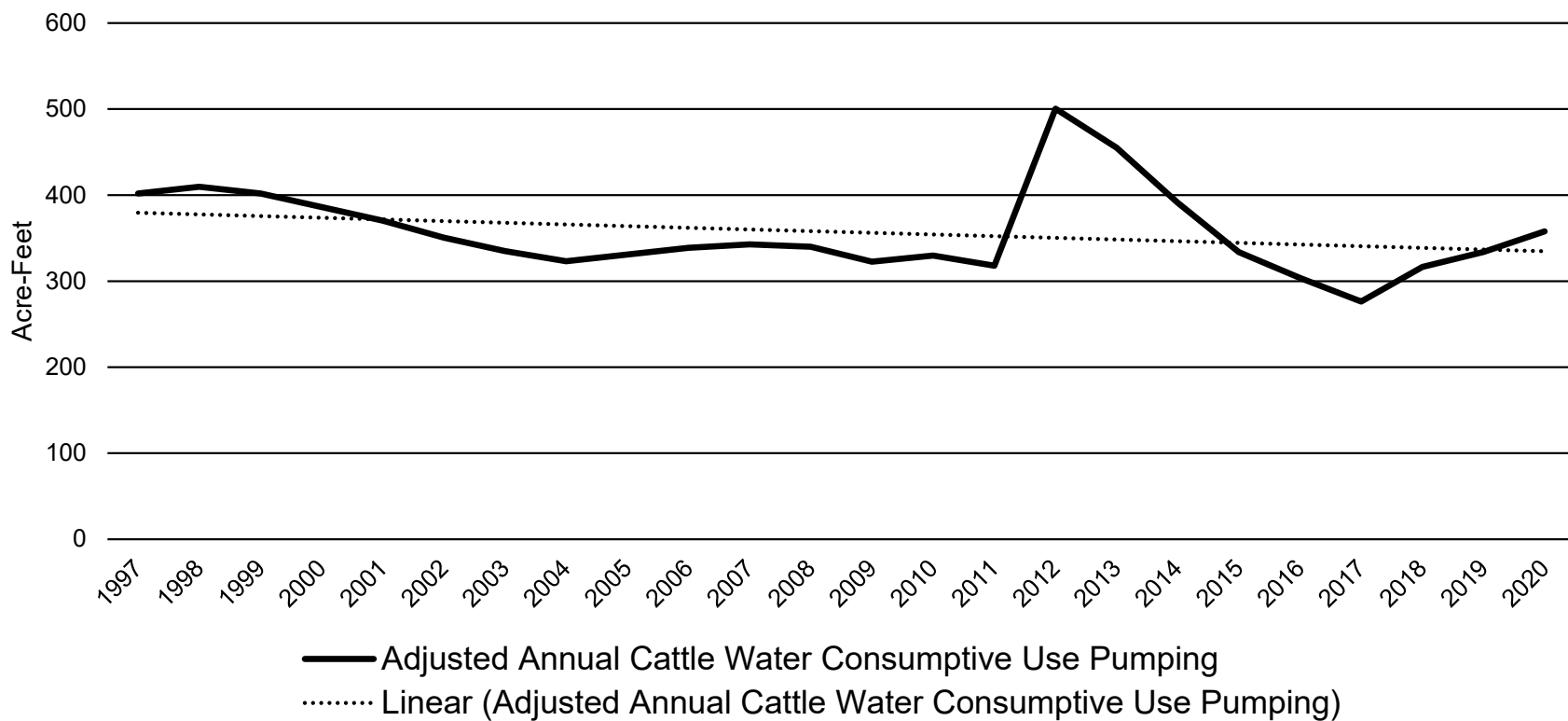


NPNRD Results – Management Actions

Livestock analysis Results:

There has not been significant changes in livestock numbers 1997-2020

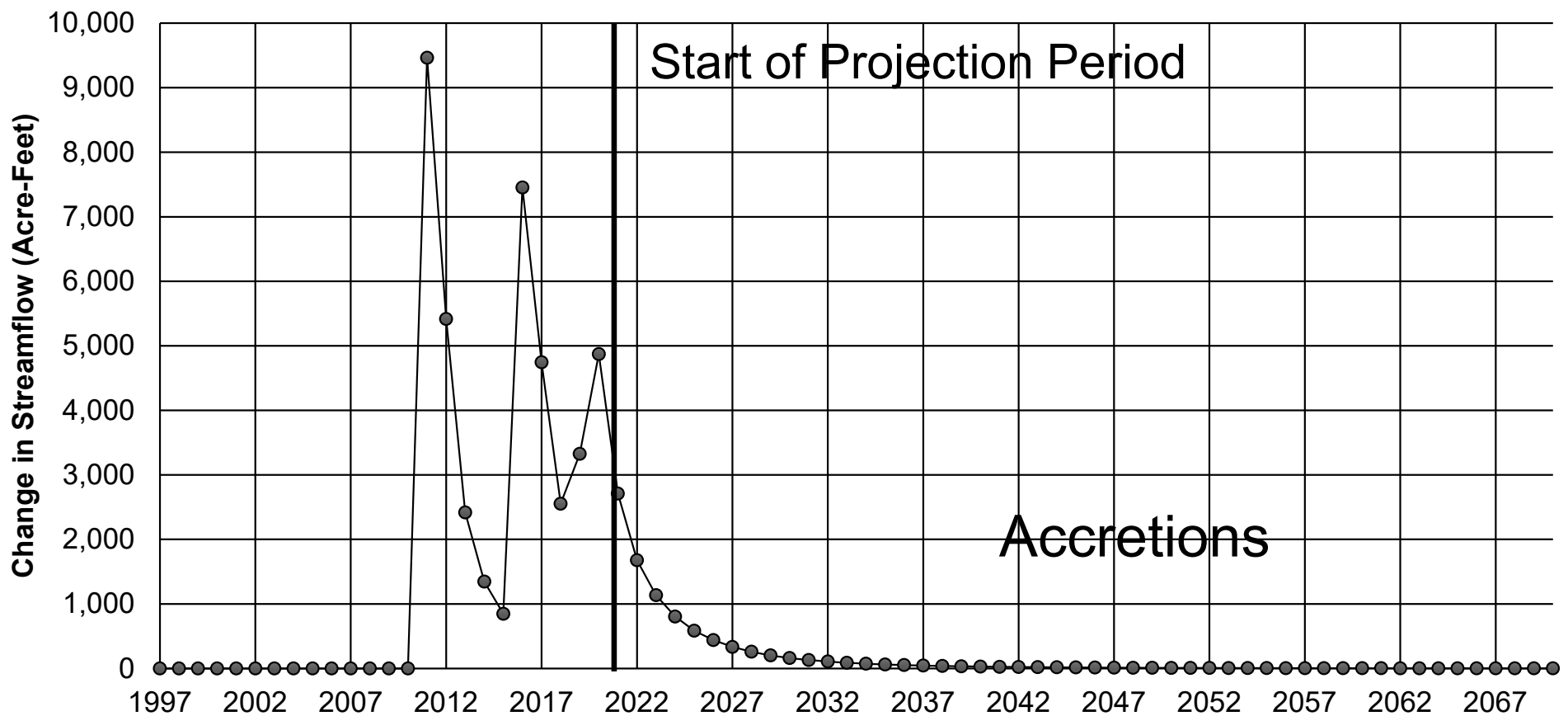
Adjusted Annual Cattle Water Consumptive Use Pumping



NPNRD Results – Management Actions

Impacts from Excess Flow Recharge

NPNRD: North Platte River



Slide 48

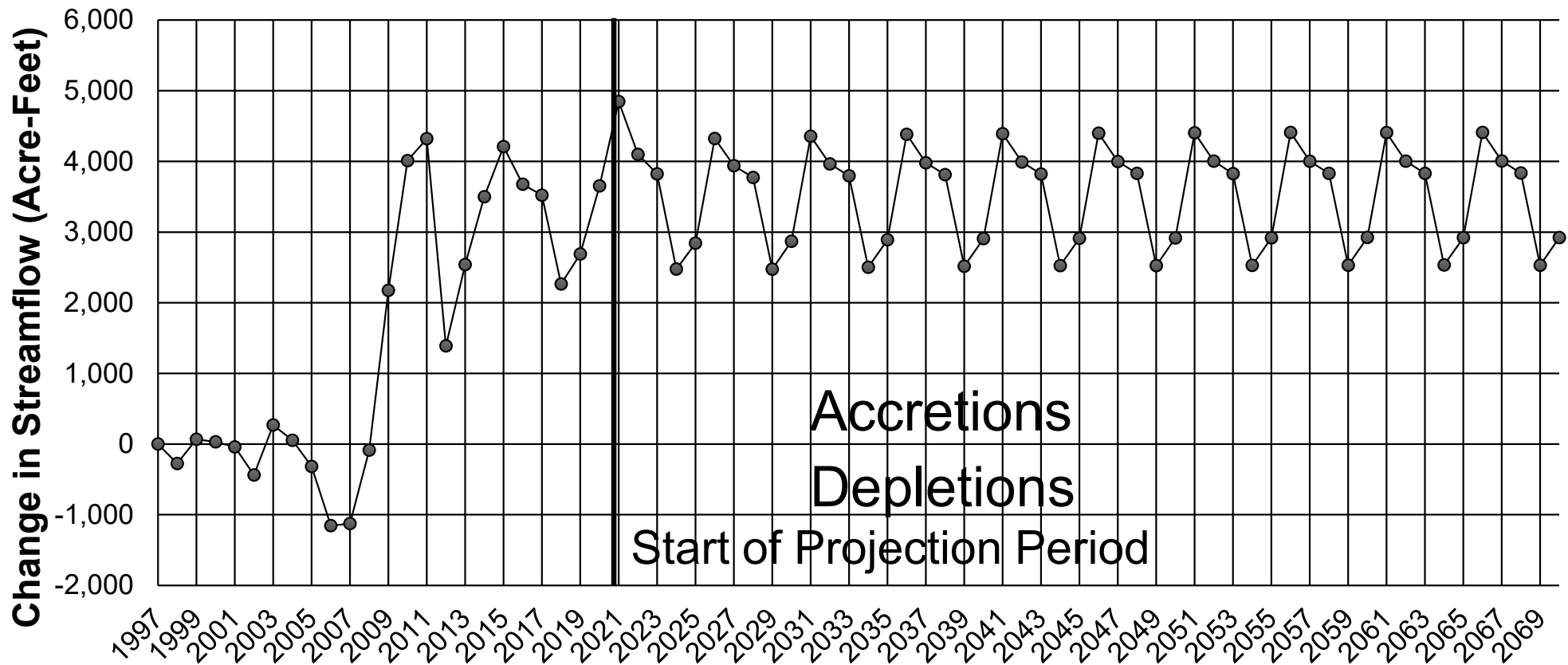
CMO

Make a combined impacts area chart for these slides

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NPNRD Results – Management Actions

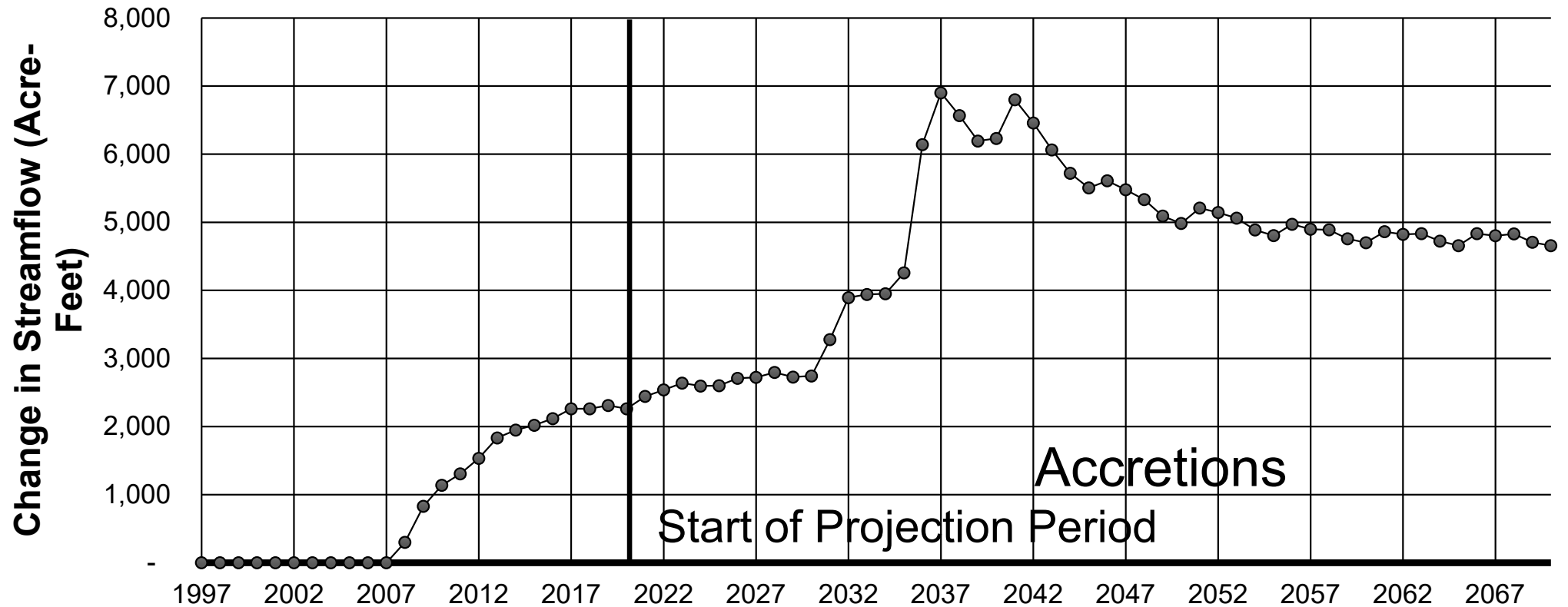
Impacts from Post-1997 Municipal and Industrial Changes North Platte NRD: North Platte River



NPNRD Results – Management Actions

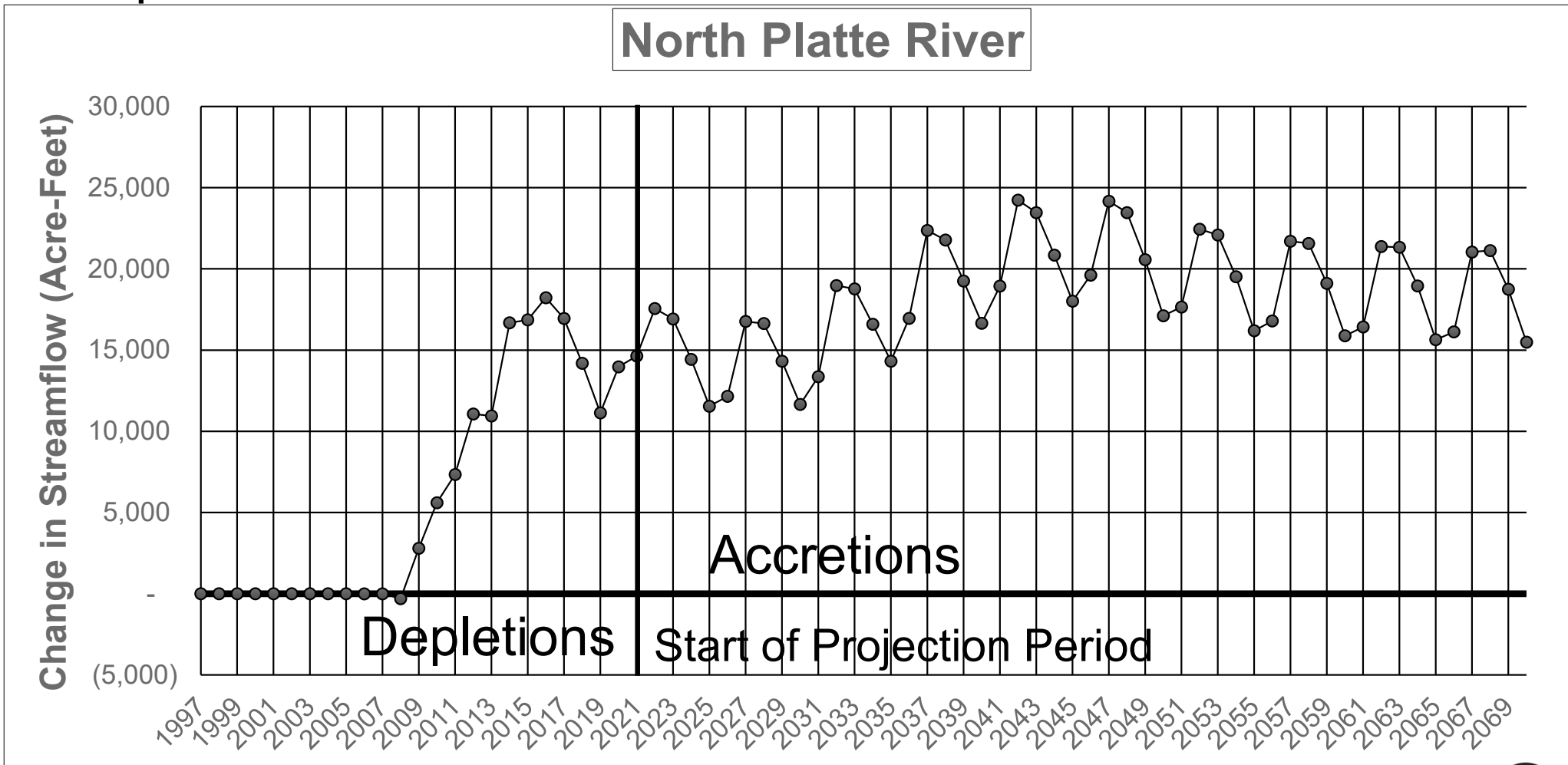
Impacts from Groundwater Retirements

North Platte NRD: North Platte River



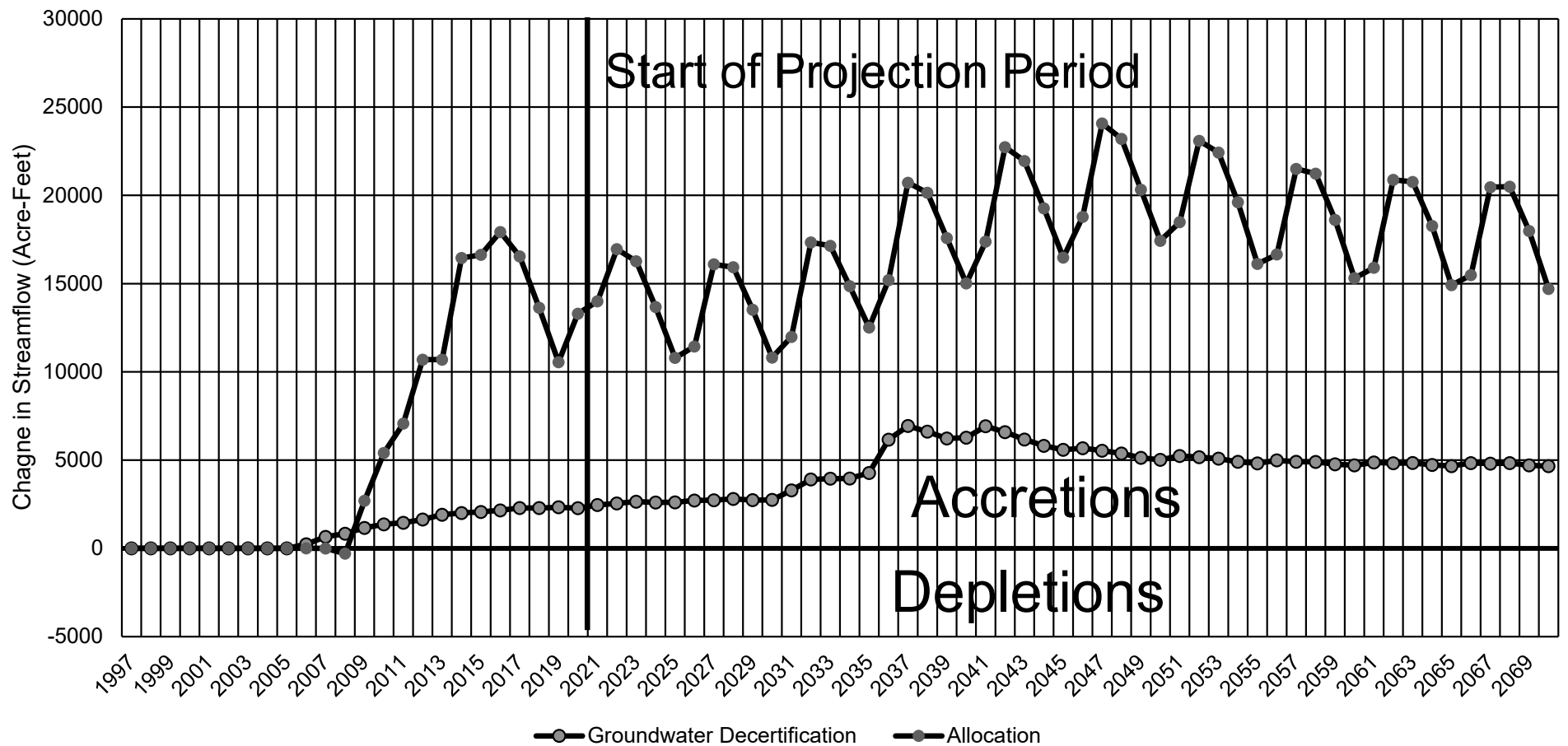
NPNRD Results – Management Actions

Impacts from Allocations



NPNRD Results – Management Actions

Impacts from Groundwater Irrigation Changes NPNRD: North Platte River



Slide 52

CM0

Alternate slide that combines allocation impacts and GW decerts like SPNRD.

Carter, Margeaux, 2024-03-12T23:28:08.532

CM0 0

[@Mott, Brooke] may want to fix colors and fonts

Carter, Margeaux, 2024-03-12T23:28:28.325